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# PATENT SPECIFICATION

602.992



Convention Date (France): June 1, 1943.

Application Date (In United Kingdom): Nov. 15, 1945. No. 30563/45.

Complete Specification Accepted: June 7, 1948.

(Under Section 6 (1) (a) of the Patents &c. (Emergency) Act, 1939, the proviso to Section 91 (4) of the Patents and Designs Acts, 1907 to 1942, became operative on Nov. 15, 1945).

Index at acceptance:—Class 70, E12(g: n).

## COMPLETE SPECIFICATION

### Improvements in or relating to Processes of and Apparatus for Manufacturing Rubber Articles, particularly Hose Pipes

I, JEAN-FELIX PAULSEN, a Belgian Subject, of 4 Avenue Marceau, Paris (Seine) France, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

The present invention relates to methods and machines for vulcanizing elongated hollow articles made of vulcanizable material and more particularly of tubular articles such as flexible or semi-flexible rubber hose pipes.

Methods whereby articles are vulcanized by contact with a fluid at an appropriate temperature, e.g. water or steam, and if necessary under pressure have been proposed hitherto.

According to the present invention, a process for the vulcanization of hollow bodies of elongated shape, more especially pipes, is characterized in that the vulcanization is effected with the aid of a hot fluid, preferably water, which is caused to traverse said body in a continuous manner, the same fluid entering into contact successively and directly with the internal and external surfaces of the said body.

A particular feature of the invention is an arrangement whereby the pressure of the fluid inside the hollow body is greater than that outside the said body.

The invention includes apparatus for carrying out the process as above set out which comprises in combination a casing in which are mounted the pipes or other hollow bodies, means for causing the fluid to pass first to the interior of the said bodies, then into the said casing in a continuous manner, and a device for producing a reduction in pressure at the outlet of the said bodies.

In the annexed drawings:

Fig. 1 is a diagrammatic longitudinal section of an apparatus established in

accordance with the invention.

Fig. 2 shows a modification thereof.

Fig. 3 is a longitudinal section of another modification.

Fig. 4 is a transverse section taken along line IV—IV of Fig. 3 to show the internal hose supporting carriage.

Fig. 5 is a vertical section of another embodiment of the invention.

The apparatus illustrated in Figs. 1 and 2 comprises a container 1 wherein the hoses 2 to be vulcanized are longitudinally disposed in parallel respective relation between appropriate supports 3 and 4. Supports 3 and 4 are in the form of perforated plates provided with a plurality of nipples on which pipes 2 are engaged by their ends. Container 1 is filled with hot water and is strong enough to withstand an inner pressure corresponding to a water temperature of about 120 to 150° C. or more.

There is provided a water circulating pump 5 and steam tubes 6 whereby water may be heated and maintained at the desired temperature. In the construction of Fig. 1 tubes 6 are disposed in container 1 itself, while in Fig. 2 they are placed in a separate heater inserted on one of the pipes connecting pump 5 with container 1.

Valves 8 and 9 are provided to permit discharge of the air from the container.

In operation hot water is circulated through the hoses 2 to be treated, as shown by arrows  $f_1$  in Fig. 1 and also between the successive hoses, as indicated by arrows  $f_2$ , which ensures a perfect and regular vulcanization.

It will be apparent to any one skilled in the art that the water used as a heating medium for the hoses could be heated by any appropriate means, such as, for instance, electric resistances disposed internally and externally with respect to container 1; also that when a hot water

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line is available, container 1 may be directly filled with water under pressure from the same.

In any case, thermostatic means could be provided to maintain the temperature at the desired value.

In the construction of Fig. 3, hoses 2 are supported by a movable carriage 10 provided with wheels 11 and also formed that it may be introduced into the container 1, which is circular in vertical cross-section. Carriage 10 is formed with transverse arms 12 having longitudinal grooves 13 adapted to receive hoses 2.

At one end of carriage 10 the ends of hoses 2 are fixed on nipples 23 carried by an end plate 14 which is tightly fixed to container 1 by bolts 15 within a sort of pre-chamber 16 also provided with a removable end plate or cover 16a through which carriage 10 is introduced into container 1. And at the opposed end of carriage 10 hoses 2 are similarly connected with nipples 23 carried by a hollow circular header 17. Header 17 may be supported by carriage 10 or it may rest on the bottom of container 1. In any case, it is so arranged that it does not hinder water circulation through container 1. The inner space of header 17 communicates with container 1 through a spring-loaded valve 18.

Hot water under pressure is derived from a hot water line 19 and it is introduced into chamber 16 by a pipe 20. It passes through hoses 2, enters header 17 and passes through valve 18 which causes a determined pressure drop. Thence water returns to the right of Fig. 3 between hoses 2 and it is returned to the hot water producer by pipes 21 and 22, the first one opening in the vicinity of plate 14, as shown.

The plant is arranged to permit the following operations:

1. Quick filling of container 1 with hot water of about boiling temperature, before vulcanization.
2. Circulating water at more than 100° C. such water being taken from the hot water line.
3. Quick discharge of the water after vulcanization.

The first operation is effected by means of a hot water tank 25 disposed at a higher level than container 1 in such a manner that water from tank 25 may flow into container 1 by gravity when the corresponding valve 26 is open. But it is generally of advantage to use a pump 24 and a corresponding piping, the whole being so devised that the presence of steam spaces is avoided. Pump 24 forces water into chamber 16 through pipe 20 provided with a valve 28.

Pump 21 is also connected with container 1 by means of a suction pipe 27 provided with a valve 29, and pipe 23 provided with valve 34 whereby pump 24 may draw water from the container. There is also preferably provided a pipe 30 with valve 31, by means of which pump 24 may be by-passed, when desired.

The vulcanization may be performed by means of a separate pump, or preferably by means of pump 24 itself the suction thereof being connected with line 19 through a valve 32, while valves 26, 29 and 31 and 34 are closed. Hot water from line 19 is then circulated as indicated by the arrows, i.e. it enters chamber 16, passes through hoses 2, escapes through valve 18, flows back through container 1 and is finally discharged through pipes 21 and 22. A valve 35 is provided on pipe 21.

When the vulcanizing operation is performed, container 1 may be discharged by means of a pump 36, the suction of which is connected with container 1 and chamber 16 through a valve 39 and pipes 37—38 respectively. The discharge of pump 36 is connected with pipe 22 through a valve 40. Pipe 38 is provided with a valve 50 which is opened at the beginning of the discharging operation.

In the construction of Fig. 5 a hose 2 to be vulcanized is helicoidally disposed around an appropriate vertical cylindrical support 41 which is removably placed within a container 1. Hose 2 rests on a grooved strip 42 helicoidally fixed around support 41. The latter is bell-shaped and fits on a vertical extension 43 of the bottom of container 1 which is closed by a removable cover 1a.

One end of hose 2 is connected with the end 44 of the hot water pipe 46 while its other end is connected with a tube 45 opening into a box-like member enclosing the spring-loaded discharge valve 18. Water is discharged from container 1 through a pipe 47.

The operation is the same as in the case of Fig. 3 but the hose pipe to be vulcanized has not to be cut into a number of relatively short sections. On the other hand, it must be flexible enough to permit its winding around support 41.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Process for the vulcanization of hollow bodies of elongated shape, more especially of pipes, wherein the vulcanization is effected with the aid of a hot fluid, preferably water, which is caused to traverse the said body in a continuous

manner, the same fluid entering into contact successively and directly with the internal and external surfaces of the said body.

5 2. Process according to Claim 1, wherein the pressure of the fluid is greater inside than outside the said body.

10 3. Apparatus for carrying out the process claimed in Claims 1 or 2, which comprises in combination a casing in which are mounted the pipes or other hollow bodies, means for causing the fluid to pass first to the interior of the said bodies then into the said casing in a continuous  
15 manner, and a device for producing a reduction of pressure at the outlet of the said bodies.

20 4. Apparatus according to Claim 3, wherein the pipes to be treated are mounted in a receptacle on a carriage provided with wheels.

5. Apparatus according to Claim 3, wherein the pipes to be treated are mounted helically on a support, for example, in the form of a drum movable  
25 with respect to the receptacle.

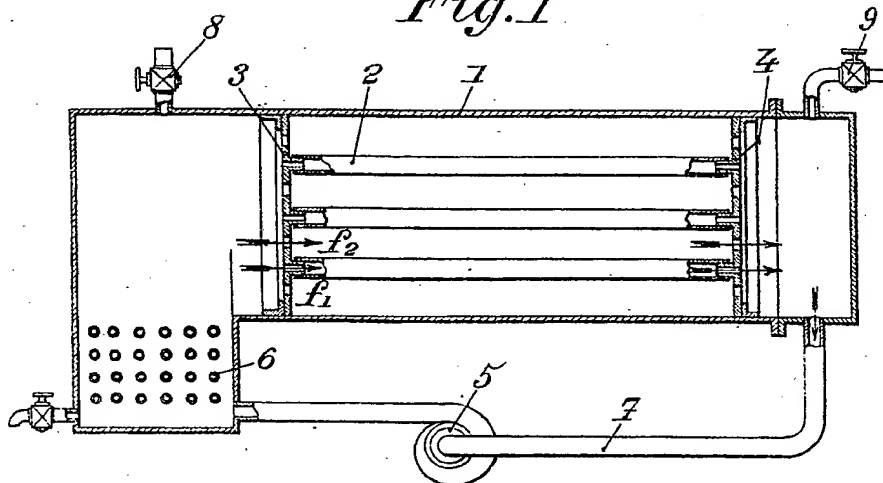
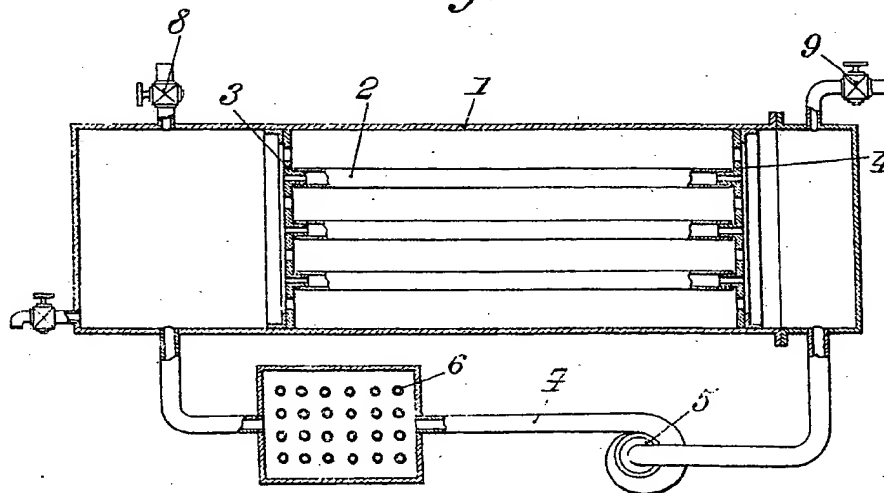
6. Apparatus according to Claim 3, wherein the casing is provided with means for circulating the water both inside and outside, in combination with a pump  
30 which can serve successively for the introduction of hot water and circulating the latter.

Dated this 15th day of November, 1945.

For the Applicant:

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*Fig. 1**Fig. 2*

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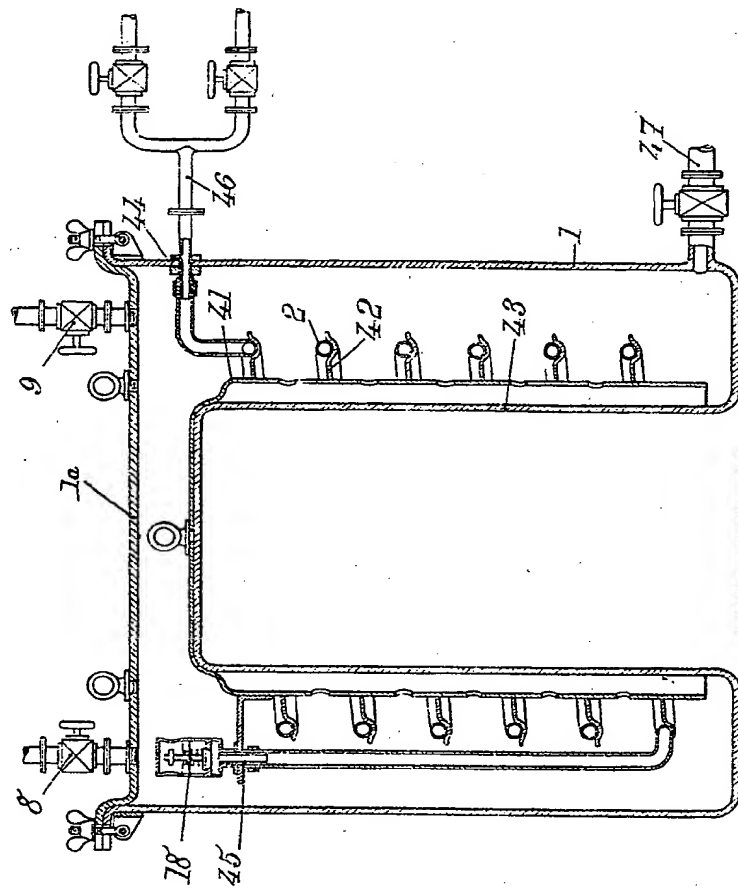
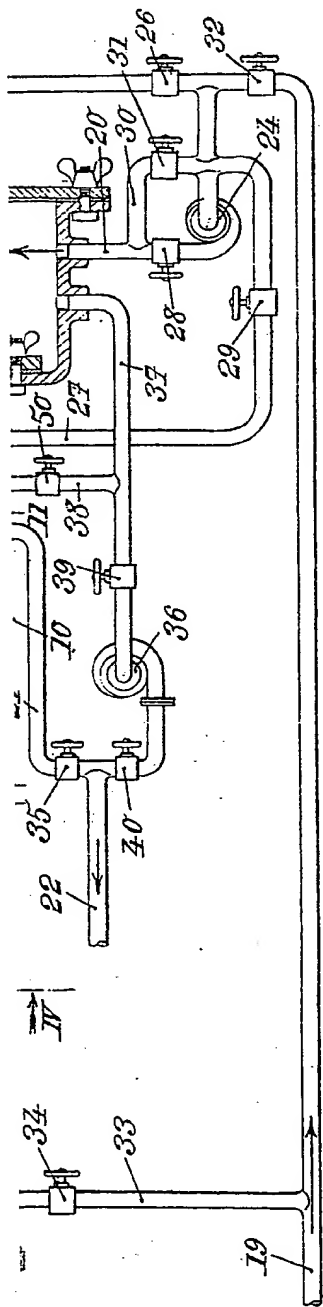
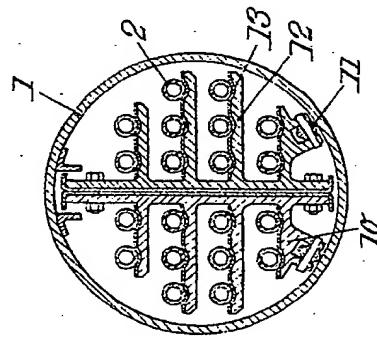
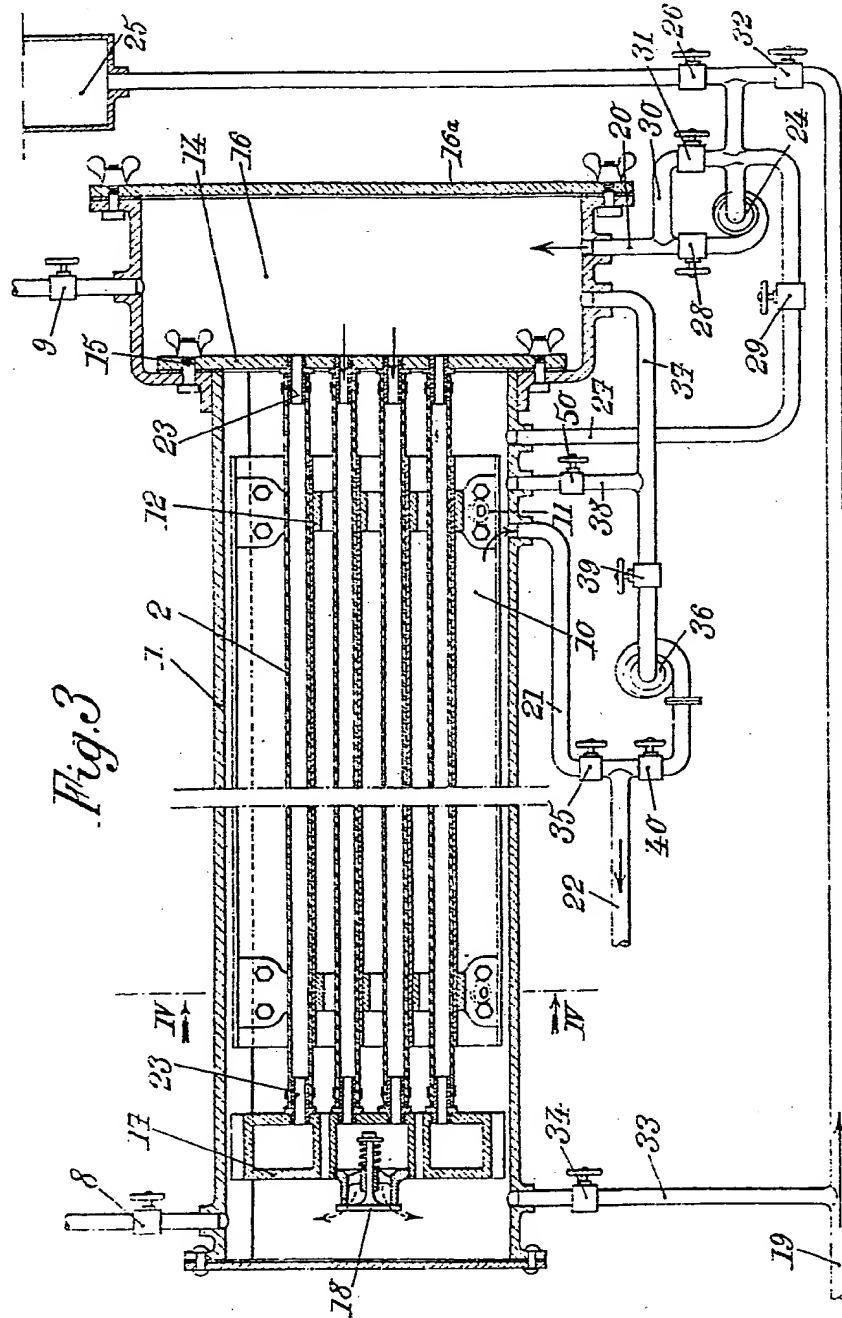


Fig. 5.

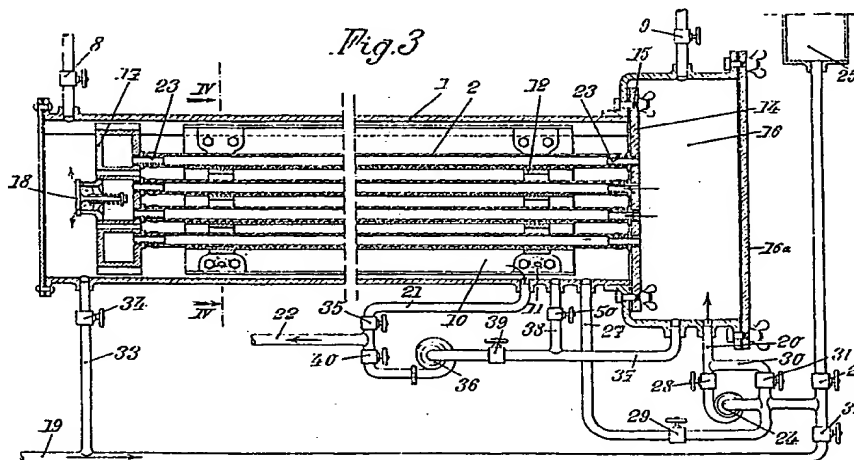
Fig. 4.



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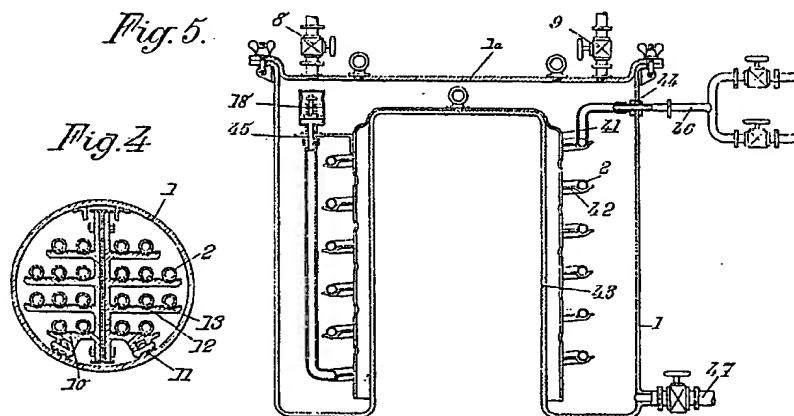


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602,992 COMPLETE SPECIFICATION

SHEET 2



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SHEET 3

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